

Understanding Business Model Canvas for Smart Cities: A Theoretical Review

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Summary:

Cities form a major progress in the advancement of a country's economy. Cities are defied with increasing population growth and need to implement smart solutions to become more buoyant to economic, environmental, and social challenges posed by ongoing urbanization. Developing a smart city in a developing economy becomes a challenge with the other forefront challenges. The high amount of initial financial investments needed for consolidation of different departments and sectors and lack of a systemic approach may have a negative impact on industry growth. Cities benefit from a transparent overview of best practice solutions to become smarter and from identifying best-suited solution providers. Companies that make cities smarter benefit from becoming more visible to cities around the globe with their newly developed or proven solutions. Business models help accelerate the adoption of smart technologies. This paper conducts a theoretical review on the concept of business model canvas for smart cities. It studies the economics of smart cities globally. Case studies of smart cities around the globe are discussed with the conduction of business model canvas for different services. The case studies are reviewed to understand the importance and challenges of the application of business model canvas for different services in smart cities. Smart cities will eventually deliver true convergence of lifestyle and technology and improve the overall quality of life for citizens.

Keywords: Business model, innovation, street lighting, smart cities, smart waste management and smart mobility.

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Introduction

Smart city initiatives are hyped and embarked in every region in the planet. This diverse movement has been widespread with an enthusiasm for urban renewal and focus on sustainability. Cities are responsible for the socio-economic development and quality of life. An amount of 38.9 billion dollars is estimated to be spent on smart cities (Cisco, 2017). Cities are the engines of growth and play a very important role to achieve faster growth, which will inevitably imply a structural transformation and a rising share of industry and services sectors. Planning for urbanization and better management of cities is therefore not only important for the quality of life for those living in our cities and towns, but also because it contributes to a better investment climate. Smart city is an understandable concept based on the ideologies for citizens and industries. Cities need to be efficient, sustainable, equitable and livable (Arora, 2018). Smart cities are characterised with technological innovations, policy innovations and the management innovation (Rana, 2018). Internet of Things (IoT) is the emerging technology in the context of smart cities and is being set up for different projects. Use of IoT as a technology to connect between the physical and virtual world in the field of waste management could help in significant and fundamentals ways (Diaz-Diaz, 2017). As a challenge to urban sustainability, smart cities are gaining the attention and momentum positively.

Business strategies are developed to reduce costs and resources with the inclusion of value proposition. Likewise, they have always been at the origin of social innovation. Business models have routed its way through smart cities. Business model can be defined by three core components of creating, delivering and capturing value in the economic, social and cultural forms of value (Anthopolous, 2015). The importance of business models in smart cities has developed tremendously due to the number of stakeholders involved in the process. Every service involved in the context of smart cities connected with a value proposal following contemporary or innovative business models (Anthopolous, 2015). Teece (2017) defined business models as design and architecture of values creation, delivery and capture mechanisms. Business models provide an architectural design for smart cities and provide the government with strategies to meet customer expectations. The concept of business models is encapsulated by three core principles of value proposition, value creation and delivery and value capture.

The paper provides an understanding and review of business model canvas and business model canvas for smart cities. It further analyses the literature and investigates the working business model canvas for smart cities worldwide. The first part of the paper discusses the smart city scenario globally and the smart city economics. The research provides answers to the research question: how business model canvas can help develop better smart city strategies?

Smart City

Smart cities are defined as the paradigm of progress to the new world. The enthusiastic development of innovative technologies delivers prospects to build smart cities (Winkowska, 2019). Countries are building cities with social, economic and sustainable aspects to enhance the quality of life for the citizens. Along with the incorporation of ICT smart cities intend to prioritize on the protection and security of its citizens, financial independence and social infrastructure. Cities are real-time systems, and smart city is made up of several smart systems. An intelligent city will have smart physical, social, institutional and economic infrastructure in a sustainable environment, with its citizens at the centre of these systems (UKTI, 2016). Smart cities are moving towards shaping the future of the world. Cities are the engines of growth and

play a very important role to achieve faster growth, which will inevitably imply a structural transformation and a rising share of industry and services sectors. Planning for urbanization and better management of cities is therefore not only important for the quality of life for those living in our cities and towns, but also because it contributes to a better investment climate. This has resulted in a huge trend around the world for people to be involved in smart cities. A google trend search provides around 900 results on smart cities in 2018-2019 (See Figure 1).

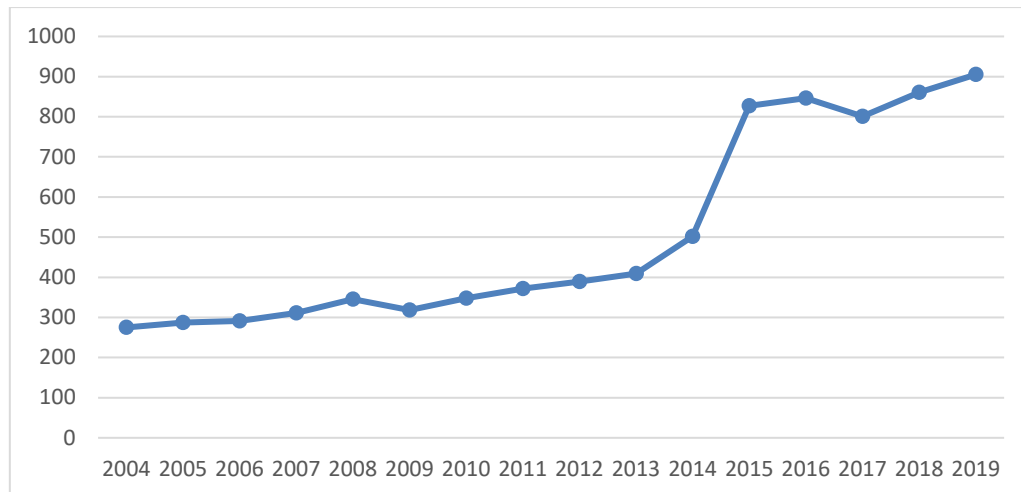


Figure1: Smart City Trends Worldwide Source: Google Trends

Smart city scenario globally

Global research shows that smart cities have been the implication of urbanization. Cities around the world have conferred about this concept and accepted the technological, economic and social aspects. The concept popularised in the 2010s to advance the technologies in cities and engage data in running the cities better (Smart City Strategies, 2017). The smart cities build a richer knowledge base for cities that are embarking on their own way for development in around different regions. Smart city strategies are made through collaborative stakeholder engagement with city stakeholders and citizens.

Rapid urbanising cities in South east Asia and China, work based on top-down approach which allows for better decision-making for cities growing at unparalleled rates. Smart cities global technology revenue is expected to grow up to an average of \$263 billion by 2028 (Navigant Researcher, 2019). Literature shows that in 2017 there were more than 250 smart city projects in 178 cities worldwide. Europe aims to develop 300 smart cities by 2020 which will be the largest number of smart city project investments globally (European Commission, 2017).

Tokyo's smart city plan focuses heavily on sustainability, exploring how technology can reduce food waste and energy usage. Vienna is implementing over a hundred smart city solutions in education, energy management, environment, healthcare, mobility, social inclusion, and urban development (Roblek, 2019). These projects are scope based and are focused on development through innovative projects or incorporated with different city services and municipal departments. In some countries the projects and strategies are based on the scalability, size of smart city projects, funding available and the involvement of citizens. Better Reykjavik is a participatory budgeting portal that allows citizens to suggest and vote electronically on ideas to improve their neighbourhoods (Bjarnason, 2014). This has given rise to over 600 citizen

ideas implemented at an average project size of only USD 32,000 (Council of Europe, 2017). In contrast, central planning in Shenzhen helped its smart city projects scale tremendously. It equipped 700 buses with facial recognition technology. Unique identification numbers were issued to 600,000 buildings and 11 million flats. Its online public service resource centre has 14 billion records and exchanges 20 million records daily (Smart City Governments, 2019). Integration of data and analysis of results determined from undertaken projects like, New York integrated the call centres of over 40 City departments into a single municipal services hotline, and analysed data from over 18 million requests to improve city services, introduce new initiatives, and raise customer satisfaction (Woetzel et al., 2018). Helsinki's smart city development is driven by different agencies innovating at the municipal level; as a city; for its metropolitan area; and within its smart district. While the initiatives may not be fully integrated, the decentralized leadership helps to ensure its resilience as a smart city (Appio, 2019). In developing countries like India, smart city strategies encompass the delivery of core infrastructure as well as the ICT and innovation. The smart city concept in this context is a signal of the aspiration to leap to the cutting edge of modernity.

Smart Cities Mission India: With the announcement of the Smart Cities Mission (SCM), Narendra Modi, the Prime Minister of India has moved a step towards the digital and technological development of the country. The purpose of the SCM is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology especially that leads to smart outcomes (GoI, 2015). The Indian cities need to be developed to provide adequate quality of life and focusing on retrofitting – city improvement, redevelopment – city renewal, greenfield development – city extensions and pan-city initiatives with smart solutions. The purpose of the SCM is to resolve the urban problems through urban infrastructure developed by advancements in ICT based technology. The mission aims to revitalise structural imbalances, create a sustainable city and a liveable environment with economic prospects. A detailed selection process was designed by the GoI to choose the smart cities. Initially the cities were selected by the 36 states nominated based on urban population and number of statutory towns. The city challenge round for selection of cities required every selected city to provide a smart city proposal. A total of four rounds of selection and one round of fast-track selection were conducted to choose the cities based on the proposals submitted. Total of 99 smart cities have been selected with total project costs of INR 2031.72 billion (Smart City Mission Dashboard). An urban population of 99,630, 069 people would be impacted by these developments. Total of INR 116.05 billion has been allocated for area-based development projects and INR 22.58 billion for pan-city projects. Projects have been categorised into open space and riverfront development project, affordable housing projects, applications (Apps) based solution projects, Public Private Partnerships (PPP) projects, city wise projects and projects of INR 1 billion and above (SCM, MHUA, GoI website, 2018). A special purpose vehicle (SPV) has been created in each selected city to monitor the progress and evaluate the smart city development projects. The economic growth and improved quality of life for citizens is the major aim of the program. A competitive and co-operative federalism, leadership and vision for the programme, understanding the new concepts, major investments and utilisation of funds, citizen involvement were the challenges in the initial stages of implementation of smart cities (SCM, MHUA, GoI website, 2018).

Smart City Economics

Sizeable economic investments are required to make cities smarter with technological innovations. If tangible value is not obtained from the smart cities around the city region or

countries, then the added financial values are drained down (Tadeau, 2015). Globally smart cities are expected to reach a spending of USD 237.6 billion by 2025. With the way economies work, technological development or benefits to citizens might not be enough to sustain the continuous advancement of smart cities if they come at a great financial loss. Fortunately, the successful implementation of smart city initiatives comes with many economic benefits (Kitchin, 2014). Automation brings cost savings, with AI-based and IoT technologies automating city resources such as water and electricity and saving significant amounts of money (Martinidis, 2019). Smart city sensors are used to increase efficiency by making sure resources are used without sensors. Increasing safety and security and cutting down expenses with readiness for mitigating risks and reducing damages during disasters helps cutting down smart city expenses. Providing a quality life for citizens helps them to improve and further develop and care more about the cities, safer, happier environment of the smart city, leads to a rise in the GDP and overall economy of the city. Connectivity, the smart city feature of having every device connected to each other, improves the city's performance and this is strongly connected to its economy. With reduced emissions and cleaner cities, greatly increases the standards of living, happiness and leads to economic growth and sustainable ecosystem smart transportation, reducing congestion and pollution, can have great benefits in terms of money and time saved. Big data, finally, are extremely valuable both to city authorities and especially to companies, who find them very important for commerce, although strict ethical and legal standards have to be maintained with regard to these uses. Smart cities are a great investment that can positively impact the economy worldwide and are expected to show an economic development of 5% annually with financial turnaround of 20 trillion in a decade (Martinidis, 2019).

Business Model Canvas

Business model is defined as the rationale of how an organisation creates, delivers and captures values. Osterwalder and Pigneur (2010) created the Business Model Canvas (BMC) as a framework for describing, visualising, assessing and changing business models. BMC is used as a visual framework for describing nine different elements of a business model. It illustrates what the business does, for and with whom, the resources it needs to do that and how money flows in and out of the business. It can be used to design new models or to analyse current models (Thomas, 2013)

Business model canvas (BMC) is adapted from Osterwalder and Pigneur (2010). The BMC presents a clear description of the nine elements of business model covering the four main areas of any business: product, customer interface, infrastructure management and financial aspects.

- Key Partners: who would be responsible for the execution of the smart city projects. A strengthened relationship with key partners provides a value network optimization and performance for the organisation.
- Key Activities: The process that needs to be followed to conduct the smart city projects. Objectifying good resources to conduct the activities positively impacts the cost and the transformation of the projects.
- Value Proposition: the core of the business model describes what needs to be done to deliver and capture value. Leads organisations to a competitive advantage with a well-designed and executed values proposition (Wirtz et al., 2016).
- Customer Relationships: The kind of relation smart city projects would develop with customers. Expectation of quality of life provided by the projects.
- Customer Segments: describes the interaction with customers. Comparatively studies the customer base.

- **Key Resources:** Is associated with key activities and the cost structure.
- **Channels:** how to reach the customers with desired delivered value.
- **Cost Structure:** The finances and budget requirement.
- **Revenue Streams:** profits and the delivery of profits from the executed projects.

The business model canvas contained nine building blocks showing different elements that together lead to a value proposition. As shown in Figure 2, the business model canvas shows who the customer is for a certain product or service (customer segments), how these customers are reached (channels) and the type of relationship the company has with the customers. Together these three blocks result in a revenue stream for the company (Quak, 2014). The left-hand side shows the elements that are necessary to make a product or create a service. The left-hand side shows which partners are used, what activities are undertaken, which resources are used to make a product or create a service. These blocks eventually show for what costs a product or service can be made (Aagaard, 2019). As a business tool the business model canvas (Osterwalder and Pigneur, 2010) is used to accelerate innovative business ideas and activities in society. The triple layered business model canvas is an extended version (Joyce and Paquin, 2016) and a more holistic view of the existing business model. The triple layer model focuses on the sustainability -oriented business model innovation by exploring the environmental and social aspects of the business along with the economic perspectives.

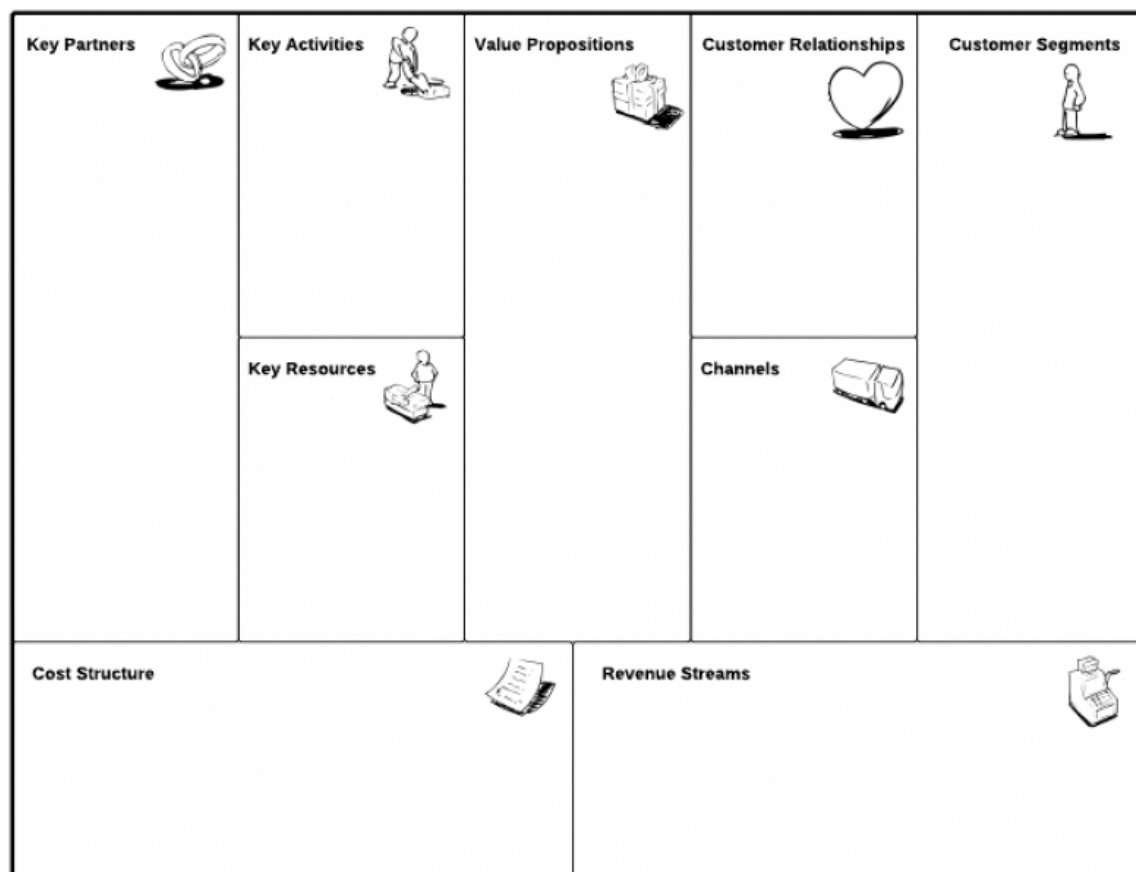


Figure 2: Business Model Canvas Source Osterwalder and Pigneur 2010

Research Gap

Existing literature on smart cities emphasises on the progress of cities dynamics on technology and the resulting benefits. Adequate guidance is not provided to city leaders on operations and

building policies. City planners require forward-looking and practical comparisons and guides, by understanding the budgets, infrastructure, policies, services, and innovative governance and resourcing models of different cities (Smart City Governments, 2019). The knowledge gap between the theory and practice in smart cities remains at a preliminary stage (Mora, 2017). Smart cities provide an insight into the development that the government wants to provide for better quality of life for citizens. The smart city market value is uncertain, enterprises prefer to secure their involvement with government support, standardization and business models (Giles, 2012). Literature shows a sharp increase in the smart city research evidenced by the google trends search in Figure 1. The effective knowledge and tools for supporting the operative implementation of smart cities with business models is lacking in literature (Lee et al., 2014). Research on smart cities focuses on the technology innovation than the appropriate business model for cities. This paper addresses the knowledge gap on smart city business model and provides a research orientation on the working business model canvas for smart cities worldwide.

Methodology

The literature analysis methodology has been used to develop the study on understanding the business model canvas for smart cities. This section of the paper is dedicated to describing the research analysis methodology and the research steps followed. This methodology has been used here to review the literature due to the abundant availability of research reviews on smart cities and business models in literature. The analysis methodology is not only used for this current research but also in longitudinal research or a comparative study.

The following four steps were followed in the literature analysis methodology (Paré et al., 2015):

- 1) Subject definitions
- 2) Literature search
- 3) Literature analysis and synthesis
- 4) Research agenda

Subject Definitions: A systematic research was conducted to define the terms business model canvas, smart cities and a review on smart cities globally conducted. Google trends were checked to see the diverse search for these subjects in a period of 10 years.

Literature Search: The database Scopus and Elsevier were used to search for relevant research for this study. Of these searches Scopus has been a database more efficient on the grounds to smart cities and business models. The required search was conducted with an approach using a combination of keywords including, smart cities, business models, business model canvas. Title, abstract and keywords were searched for the above terms. Also, citations identified from existing documents were reviewed to get further information. Inclusion and exclusion criteria for studies were applied to find the relevant papers in the field of study. A review of the inclusion and exclusion criteria was conducted with academics experienced in the field of study. As the search did not provide vast number of papers, the inclusion and exclusion criteria were underapplied to relying on the abstract review.

Literature Analysis and synthesis: Relevant papers were reviewed based on the context of the search and review of the abstract. All the peer reviewed research papers were reviewed and a total of 23 papers were considered for this review. No restrictions on the year of publication and only English publications were reviewed. 11 articles on business models and 12 articles on smart cities were studied for the research.

Research agenda: Business models and smart city case studies from around the world were classified from the reviewed articles.

Case studies

A business model aims to determine the viability of the project theoretically and identifies the threats and complications before executing the project. It helps to identify the financial income and outcomes (Boon, 2016). Business model canvas provides a holistic and integrated view to smart city business model and innovates toward a sustainable value creation (Giourka, 2019). A business model canvas for a city needs a city model, to show how the city will create and sustain value for its citizens. Value needs to be created by social welfare, environmental sustainability and economic prosperity (Timeus, 2017). The study further progresses with three different case studies divided into different geographical categories in relation to different levels of technological innovation and type of human capital, which are key factors in the achievement of a smart development. Two case studies were chosen being European countries with emerging smart cities. A third case study in a developing country like India was chosen to understand the development of a business model for different smart city services.

| | | | | |
|---|--|---|---|--|
| Key Partners -Recharging provider -Vehicle providers -Consulting firms -Municipality managing the recharging infrastructure -App provider | Key Activities -Manage relations with beneficiaries -Citizen awareness campaigns and citizen engagement activities for public transport and adoption of e-vehicles -Maintain political mandate | Value Propositions -To offer low-carbon mobility solutions To offer expanded public transport options -To increase the efficiency of public transport use - To reduce congestion -To create new business opportunities in the mobility sector | Buy-in & Support -Political buy-in -Associations to incorporate e-vehicles -Companies and other municipal utilities to incorporate e-vehicles | Beneficiaries -Electricity providers who benefit from use of recharging station -EV manufactures -Recharging station producers -Start-ups and local business selected to get involved in projects |
| | Key Infrastructure & Key Resources -Ability to issue permit to restricted zones to early adopters of e-vehicles -Public recharging network -E-public transport and municipal e-fleet | | Deployment -Improve recharging infrastructure, including fast charging stations -Advanced mobility services, such as applications to find closest/best recharging option | |
| Budget costs -Cost of expanding infrastructure (e.g. for the charging stations), electricity costs, Cost of purchasing e-vehicles -Financial incentives for early adopters of e-vehicles | | | Revenue Streams -Horizon 2020 grant (short term) -Taxation and Fees & user payments for transport -Potential fuel savings from integration of e-vehicles | |
| Environmental cost -The impact of increased electrical consumption (to varying degrees depending on the source of electrical power) | | | Environmental benefits -Reduction of greenhouse gases and local pollutants (and noise) from more efficient transport, from use of electric vehicles, and from potential reduction in private vehicle use | |
| Social costs -Possible increases to tourist flow and potential of gentrification due to improved accessibility of the district | | | Social benefits -Access to transport for previously unreached areas; positive health impact from emissions reduction; some job creation through expansion of transport system and recharging infrastructure | |

Figure 3: City Model Canvas Sustainability Mobility in Donostia/San Sebastian

Source: Timeus et al., (2017)

Donostia/San Sebastian: With a population of approximately 186,000 people the municipality of Donostia/San Sebastian is the capital of the province of Guipuzcoa in the autonomous community of the Basque Country in northern Spain. The city was designated as the 2016 European Capital of Culture, commerce and transport, are also important drivers of the city's economy.

The City model canvas methodology was applied for different services like energy, ICT and mobility. In the area of mobility Donostia/San Sebastian has planned to introduce electrical buses and charging stations for e-vehicles.

Figure 3 shows the city model canvas for sustainable mobility for the city of Donostia/San Sebastian. The model provides variance on key partners, key resources and key beneficiaries which is discussed here. The direct beneficiaries of this city model are the current and future residents, who will benefit from improved frequency of transport to the city centre. Business will benefit from partnering with the pilot projects and new business opportunities due to improved transport access to the area. The project aims to move goods and citizens across the city and aim to save time and reduce greenhouse gas emissions.

Street Lighting Santander

Santander is the capital city of Cantabria north coast of Spain, with a population of around 180,000 people approximately. The city is known for its old town, beaches and other tourist visiting sites. The European Union funded the SmartSantander project to make the city viable with technology. The city has been working on different services to improve the quality of life people. Traffic management, waste management, energy management, security systems, installation of 12,000 sensors are some of the major projects taken up by SmartSantander.

Street lighting in cities results in around 2.3% of the global electricity consumption. Santander deployed a more efficient non-conventional methodology a more efficient system that uses LED technology. Figure 4, below shows the business model canvas for smart street lighting at Santander City.

Figure 4 shows the business model for current technology of smart-street lighting being deployed at Santander. Though the initial investments for the project are high this provides with greater energy efficiency, life span and low maintenance requirements with savings up to 80% (Diaz-Diaz, 2017). The social and environmental benefits of the project are highlighted in this business model using the triple layer business model canvas (Joyce and Paquin, 2016).

| | | | | |
|--|---|---|--|---------------------------------------|
| Key Partners -City council -Data Manager -IOT infrastructure maintenance manager -Energy supplier -Design company | Key Activities -System planning -Facility maintenance -Data management of information collected by sensors through the big data platform | Value Propositions -Lighting system for all city areas at lower economic costs and less -environmental impact, with a slight reduction of the illumination level when pedestrians are not passing under the streetlights | Customer Relationships -Light usage in public spaces through a self-service relation. | Customer Segments -Citizens |
| | Key Resources -Civil Servants -Luminaries and other facilities -Energy Supply -Motion sensors and data management platform. -Data Management and IoT infrastructure technicians | | Channels -Promotional materials -News in the media. -Emails from the citizen information service at the city council -Public conference, workshops, hackathons, and other activities to disclosure information about Santanders smart city projects | |
| Cost Structure -Employee salaries -Investment in facilities and maintenance expenditure, -Energy supply - IoT infrastructure maintenance and data management services | | | Revenue Streams -The city Council uses collected taxes to pay the server provider | |
| Social and Environmental Cost -Energy Consumption and Environmental impact, but lower than without IoT. -Slight reduction of the illumination level during the period of enabled lighting if nobody walks under the streetlights. | | | Social and Environmental Benefit -Lower service cost should allow tax reduction -Less energy consumption and reduced environmental impact -Quality job creation to manage the service -Smart ecosystem development in the city. | |

Figure 4. Business Model Canvas for smart street lighting-Santander City
 Source Diaz-Diaz et al.(2017)

Nagpur ICT based Smart Waste Management

In view of the two case studies identified above an example smart city was selected to work on the business model canvas. A city from a developing nation was selected to see the working of technology and use of business model to work on the project. Nagpur located at the heart of India is the geographical centre of the country enabling it to be the logistical hub of India. The city has a population of 2.5 million people and 52% of the district population residing in Nagpur, it is the 3rd largest urban area in the State of Maharashtra, India (MHUA Smart City, 2011).

| | | | | |
|--|--|---|--|--|
| Key Partners -Municipal Corporation -Truck and Container providers -Users -Local Contractors | Key Activities -Waste collection -Management of information collected through smart devices - Waste processing | Value Propositions -Quality service for waste collection, at lower economic costs and less environmental impact | Customer Relationships -Users dispose waste in containers -Users inform damages in the smart systems -Personal and exclusive assistance | Customer Segments -Users/Citizens -Municipal Corporation -Companies that buy waste to process recycled waste |
| | Key Resources -Employees -Trucks and containers -Sensors -IoT infrastructure -Waste processing plant -Tender processing | | Channels -Promotional materials -Media news -Public conferences, workshops, to spread awareness about the project -Mobile applications for citizens | |
| Cost Structure -Employee salaries -Logistic expenditure -Waste processing plant -IoT infrastructure service management cost | | Revenue Streams -The city Council uses collected taxes to pay service provider -Recycled waste sales. | | |
| Social and Environmental Cost -Energy Consumption and Environmental impact | | Social and Environmental Benefit -Lower service cost should allow tax reduction -Quality job creation to manage the service -Smart ecosystem development in the city. -A clean city attracts tourism. -Less energy consumption. -Urban healthiness reduces public health problems. | | |

Figure 5: Business Model Canvas for smart waste management Nagpur City

Smart Waste Collection: For clean streets, the city is using real-time information to monitor waste collection and improve street sanitation. In 2017, Nagpur was ranked 137 out of 434 Indian cities for street cleanliness. While 33 percent of residents surveyed said that waste was not collected from their households daily and that garbage trucks did not turn up for 15 days at times (Yi Ming, 2019). The city government started geo-tagging street sweepers and waste collection fleets. Location-tracking devices and cameras were mounted on garbage trucks to collect real-time information and capture images of bin collection, while the city's 7,000 street sanitation workers were equipped with GPS-enabled watches. The city concluded a pilot test of RFID-tagged and sensor-equipped large wheeled waste bins along Nagpur's special 5.8-kilometre-long smart street. Weight sensors track bin waste amounts and notify the city operation centre when the bins are full, while the RFID tags allow individual bins to be identified and their collection recorded. Real-time data is consolidated in a Unified Operations Centre to make timely decisions. Data is overlayed onto a GIS base map to optimise waste collection routes, collection times, fuel consumption, and response times. The centre also updates residents on garbage collection times and engages them with sporadic surveys on waste management (Yi Ming, 2019).

Nagpur city today is motivated by its need to drive economic growth, increased investment and job creation, allowing for better standards of living, and the financial capability to manage the city infrastructure that serves the wider urban environment. Smart waste management

initiatives have moved from compliance to value creation. From waste bins equipped with fill-sensors, to data-based management and logistics platforms, the industry is shifting into a cleaner, more efficient part of modern life. The business model canvas for Nagpur Figure 5, shows the importance of ICT enabled waste management systems for smart cities. The use of smart device allows a greater efficiency in the service development, resulting in the optimisation of the collection frequency and subsequently improving economy (Balpande, 2018)). The smart model encourages and simplifies direct citizen/user participation in the service management, giving them and dynamic role in the city's sustainability development. Smart waste management for cities provides an aim to improve the physical notion of cities.

The case studies above provide a clear picture of the business model canvas developed for different smart cities. A business model for smart cities is meant to guide a municipal council in expressing and articulating how it will accomplish the objectives of its smart and sustainable city strategy (Shetty et al., 2019). Smart technology and a good planned business model help develop a smart city. The business model canvas is designed to help public administrations and private vendors with designing, developing and implementing smart city projects (Tanda, 2019). The business model canvas for smart cities offers practical guide and a framework to the smart city and its network actors to map and design business models that can address the increased complexity of the urban environment and the transition to smart urbanism (Giourka, 2019). The adaptation of the business model canvas to the strategic vision of the city promotes strategic smartification planning and allows all actors in the city's ecosystem to use it with the support of the city and other related actors. Cities that wish to follow and are planning to adopt smart cities' strategies toward becoming smarter can use the business model canvas for smart cities to map their ecosystem and identify the values that various players can introduce to design successful business cases that will cater to the needs of investors, even if the ecosystem is not so mature. The value propositions are well aligned with the customer needs as they were tailored to suit the needs of the customers (Boon, 2016).

The above case studies provide an augmented offering to different smart city services with relevant technologies included. The triple layered business model canvas (Joyce and Paquin, 2016) provides a robust and holistic perspectives on sustainability oriented smart city services. This canvas, however, was developed for business modelling and therefore does not help in the early ideation phase. The business model canvas does not examine the challenges that exist in the very early-phase development of ideas aimed at rendering research or innovative ideas into business ideas. It helps in building the strategies and creating a value proposition for the organisation (Aagaard, 2019). Overcoming the challenges and developing a business model canvas focusing on the vision provides a tool with sustainable and innovative enduring solution.

Conclusion

This paper provides a review and an understanding of business model canvas for smart cities. The paper conceptualises about the importance of business models for smart cities, smart city economics and the theoretical application of business model canvas. Smart cities develop cities with innovation in process and technology. Different cities differ in the technology and methodology developed for building a smart city. It further provides solutions to the management and organisational problems. A city encounters challenges in the planning, managing and operations phase. Overcoming these challenges with a developed business model provides an outcome with better interactions with citizens. The research provides answers to the research question on how business model canvas can help develop better smart city strategies. The research question aims to generate descriptive knowledge about the process

organisations/governments undergo to move into new innovative business models for smart cities development. Decision makers, academy, business and citizens provide the augmented process for a business model operation. The research further would consider obtaining data from different cities developing smart cities with consistent analysis and interpretation in search of improvements on public management, innovation and e-governance.

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